User's Guide

Version 2.0

PASCO

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SPARKvue disclaimers

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Version 2.0

Limited Warranty

For a description of the product warranty, see the PASCO catalog.

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1 Introduction

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- "Getting started": 1
- "Teacher and Technical Support": ii

About SPARKvue

SPARKvue software combines multimedia curriculum, real-time data collection, and powerful scientific analysis tools in an easy-to-use, icon-based user interface. SPARKvue is compatible with all PASCO PASPORT sensors and interfaces.

SPARKvue is designed to become the center of your school's discovery-based science learning environment, providing both teacher and student the embedded support for exploring scientific concepts.

SPARKvue includes free pre-installed SPARKlabs™ — standards-based guided inquiry labs in a unique electronic notebook format. These SPARKlabs integrate background content, data collection and analysis, even assessment —all within the same environment. Everything you need is right there in context.

Getting started

There are three basic ways to start an investigation in SPARKvue.

- *Open* an embedded SPARKlab and follow the on-screen instructions

- *Show* a SPARKlab with one measurement in a graph, table, digits display, and meter

- *Build* a custom SPARKlab with your choice of data, displays,text, and pictures

To start learning SPARKvue, install the software,connect an interface to your computer, plug in a sensor, and start the software from the desktop icon. If you need help doing a task, you'll find step-by-step instructions in this guide.

2 Starting an experiment

1. "Installing SPARKvue": 2
2. "Launching SPARKvue": 2
3. "Connecting an interface and sensors to your computer": 2
4. "Monitoring live data": 8

Installing SPARKvue

1. Download SPARKvue from www.pasco.com/sparkvue/ or insert the SPARKvue USB drive into your computer.
2. Follow the instructions provided with the download or USB drive to complete the installation.

Launching SPARKvue

Click the SPARKvue icon to launch SPARKvue.

Connecting an interface and sensors to your computer

SPARKvue software running on your computer or mobile device receives data from one or more connected or built-in sensors. In SPARKvue, sensors that are built into a computer or device are called Onboard sensors, such as Onboard Microphone, Onboard Light Sensor, and so forth.

SPARKvue is compatible with most common onboard sensors as well as several types of external interfaces that provide access to sensors, including AirLink 2, SPARKLink, SPARKLink Air, SPARK Science Learning System, USBLink, and Xplorer GLX. To collect data with SPARKvue, you will need a computer or mobile device with at least one onboard sensor or be connected to an external interface with sensors attached.

You can connect multiple interfaces to one computer in order to do an experiment that requires more sensors than can be connected to a single interface. The interfaces can be of the same type or different types.

Use the following links to find instructions for connecting interfaces and sensors to your computer or mobile device.

- "SPARK Science Learning System": 3
- "Xplorer GLX": 5
- "Xplorer datalogger": 6
- "PowerLink": 6
- "USB Link": 6
- "Connecting a bluetooth device": 6
- "Connecting multiple interfaces to your computer": 8

SPARK Science Learning System

The SPARK Science Learning System (SPARK) includes ports for two PASPORT sensors, a temperature probe, and a voltage probe. When it is not connected to a computer, the device records data and displays it on its own screen; however, when connected to a computer, it passes data through to be recorded and displayed on the computer. It is powered either by its AC adapter, or by its rechargeable battery.

- "Connecting a SPARK Science Learning System to your computer": 3
- "Connecting sensors to the SPARKvue": 4

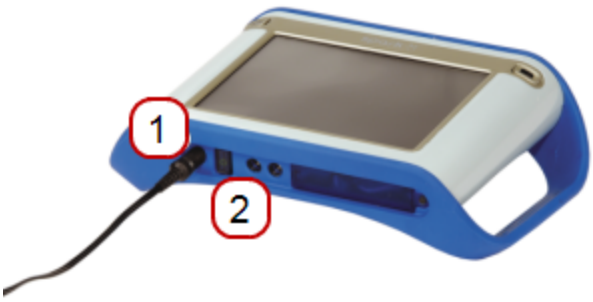
Connecting a SPARK Science Learning System to your computer

1. Use an A-to-mini-B USB cable (such as PASCO part PS-2528) to connect the smaller USB port of the SPARK to a USB port on your computer (or a USB hub connected to the computer).
2. Connect the AC adapter (included with the SPARK) to a wall outlet and to the AC adapter port on the bottom of the SPARK.

   You can skip this step if the SPARK battery is charged and you wish to let it run on battery power.
3. Press and hold the power button.

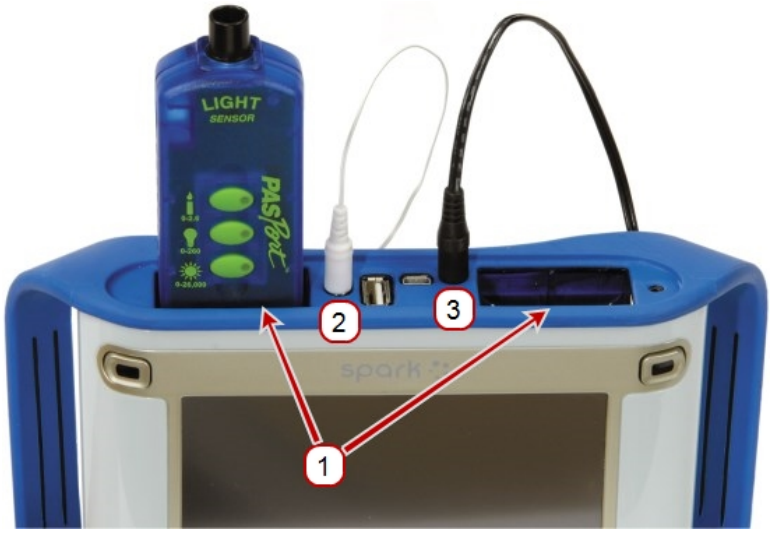
   The SPARK turns on and boots up.

   1 AC adapter port. 2 Power button.



Connecting sensors to the SPARKvue

1 PASPORT ports. 2 Temperature port. 3 Voltage port.



You can use up to two PASPORT sensors plus a temperature probe and a voltage probe.

Complete one or more of the following tasks to connect sensors to the SPARK.

- **"Connecting PASPORT sensors to the SPARK SLS": 4**
- **"Connecting a temperature probe to the SPARK SLS": 4**
- **"Connecting a voltage probe to the SPARK SLS": 4**

Connecting PASPORT sensors to the SPARK SLS

1. Plug a PASPORT sensor into one of the PASPORT ports on the top of the SPARK SLS.
2. Optionally, plug a second PASPORT sensor into the other PASPORT port.

Connecting a temperature probe to the SPARK SLS

Plug the included fast-response temperature probe (or other type of temperature probe) into the temperature port on the top of the SPARK SLS.

Connecting a voltage probe to the SPARK SLS

Plug the included voltage probe into the voltage port on the top of the SPARK SLS.

Xplorer GLX

The Xplorer GLX includes ports for four PASPORT sensors, two temperature probes, and a voltage probe. When it is not connected to a computer, the device records data and displays it on its own screen; however, when connected to a computer, it passes data through to be recorded and displayed on the computer. It is powered either by its AC adapter, or by its rechargeable battery.

- **"Connecting the Xplorer GLX to your computer": 5**
- **"Connecting sensors to the Xplorer GLX": 5**

Connecting the Xplorer GLX to your computer

1. Use USB cable (included with the GLX)to connect the smaller USB port of the GLX to a USB port on your computer (or a USB hub connected to the computer).
2. Connect the included AC adapter to a wall outlet and to the AC adapter port on the right side of the GLX.

   You can skip this step if the GLX's battery is charged and you wish to let it run on battery power.
3. Press and hold the power button.
4. The GLX turns on and boots up. If SPARKvue is running, the GLX screen displays a message indicating that it is connected.

Connecting sensors to the Xplorer GLX

You can use up to four PASPORT sensors plus two temperature probes and a voltage probe.

Complete one or more of the following tasks to connect sensors to the GLX.

- **"Connecting PASPORT sensors to the GLX": 5**
- **"Connecting temperature probes to the GLX": 5**
- **"Connecting a voltage probe to the GLX": 6**

Connecting PASPORT sensors to the GLX

1. Plug a PASPORT sensor into one of the PASPORT ports on the top of the GLX.
2. Optionally, plug additional PASPORT sensors into the other PASPORT ports.

Connecting temperature probes to the GLX

1. Plug one of the included fast-response temperature probes (or another type of temperature probe) into one of the temperature ports on the left side of the GLX.
2. Optionally, plug a second temperature probe into the other temperature port.

Connecting a voltage probe to the GLX

Plug the included voltage probe into the voltage port on the left side of the GLX.

Xplorer datalogger

The Xplorer datalogger contains a single port for a PASPORT sensor. When it is not connected to a computer, the device records data and displays it on its own screen; however, when connected to a computer, it passes data through to be recorded and displayed on the computer. When connected to a computer, it is powered by the USB port, and it does not require batteries.

1. Use the included USB cable to connect the Xplorer to a USB port on your computer (or a powered USB hub connected to the computer).
2. Connect a PASPORT sensor to the Xplorer.

PowerLink

The PowerLink contains ports for up to three PASPORT sensors. It also includes two USB ports that other interfaces can be connected to. It is powered by its AC adapter, or by replaceable batteries.

1. Connect the AC adapter (included with the PowerLink)to a wall outlet and to the AC adapter port on the back of the PowerLink,or install two “C” batteries in the PowerLink.
2. Use the included USB cable to connect the PowerLink to a USB port on your computer (or a USB hub connected to the computer).
3. Connect up to three PASPORT sensors to the PowerLink.

USB Link

The USB Link contains a single port for a PASPORT sensor.

1. Connect the USB Link to a USB port on your computer (or a powered USB hub connected to the computer).
2. Connect a PASPORT sensor to the USB Link.

Connecting a bluetooth device

The bluetooth device can connect to only one host at a time and must remain within approximately 10 meters. (An error message displays if the device is already connected to another system.)

The AirLink2 and SPARKlink Air can also connect via USB.

Note: If prompted, enter pass code "1234" for SPARKlink Air devices.

iPad

1. Use the standard iPad process to pair the PASCO bluetooth device.
2. Connect sensors as needed.

Android

1. Use the standard Android process to pair the PASCO bluetooth device.
2. Continue to step 1 of the Mac and Windows process.

Mac and Windows

To connect a device (no pairing necessary)

1. Turn on the AirLink2, SPARKlink Air or other supported bluetooth device.
2. Click the **Device Tools** button to open the Device Tools screen.

3. Click the **Connect Sensor via Bluetooth** button.

   SPARKvue searches for available bluetooth sensors and lists the supported devices within range.

   Note: In a classroom setting, there may be many devices available for connection. To ensure you are connecting with the correct PASCO device, check the back for its identification number.

   Note: If the device is not listed, pair the device using the standard Mac or Windows process before continuing.
4. Click **Connect**.

   The selected device will change from **Connect** to **Disconnect**upon successful connection.
5. Click OK twice to close the Device Tools screen.
6. Optional: plug in sensors into the bluetooth interface.

To disconnect a device

1. Click the **Device Tools** button to open the Device Tools screen.

2. Click the **Connect Sensor via Bluetooth** button.
3. Click **Disconnect**.

   The selected device will change from **Disconnect** to **Connect** upon successful connection.
4. Click OK twice to close the Device Tools screen.

Connecting multiple interfaces to your computer

- If the computer has enough available USB ports, connect each interface to a USB on the computer.
- If the computer has only one available USB port, connect a powered USB hub to the computer, and connect the interfaces to the hub.
- If at least one of the interfaces is a PowerLink, you can connect the PowerLink to the computer and connect two additional interfaces to the USB ports on the back of the PowerLink.

Monitoring live data

Live data from all connected sensors are displayed whenever the **Home** screen is open.

The **Home** screen is the first screen that appears when SPARKvue starts.

If the **Home** screen is not visible, click the **Home** button to return to the **Home** screen.

Moving on from the Home screen

With the Home screen displayed, you are ready to move into a SPARKlab. A SPARKlab is a multiple page environment where your science investigation takes place.

Complete one of the following tasks to open an embedded SPARKlab, show a measurement in a SPARKlab, or build a custom SPARKlab.

- "Opening a SPARKlab": 9
- "Showing a SPARKlab": 9
- "Building a SPARKlab": 10

Opening a SPARKlab

SPARKvue includes embedded SPARKlabs. Additional no-cost labs are available from PASCO. Complete these steps to open a SPARKlab:

1. Connect the sensors required for the SPARKlab that you wish to do.
2. If there are unneeded sensors connected, disconnect them.
3. In the SPARKlabs pane, navigate to the folder containing the SPARKlab that you would like to open.
4. Click a SPARKlab to preview.

   The lab preview opens in the right pane.
5. Click the preview to open the lab.

   The SPARKlab opens.

   Follow the on-screen instructions to continue your science investigation.
6. Click the **Page Navigator** to turn pages.

Showing a SPARKlab

A show-path SPARKlab is the fastest way to record data and display it in a graph, table, digits display, and meter.

Complete these steps to show a SPARKlab:

1. Connect a sensor.
2. In the **Home** screen, click the measurement that you would like to show.

   The selected measurement is highlighted.
3. Click **Show**.

   Note: A measurement must be selected for **Show** to be available.

   A four-page SPARKlab opens.
4. Click the **Start** button to record data.

   Click the **Page Navigator** to see your data in the different displays.

Building a SPARKlab

When you build a custom SPARKlab, you design each page with your choice of measurements and displays. You can also add text and pictures.

Connect a sensor (or sensors) and complete these steps to start building a SPARKlab.

A. From the Home screen create a new SPARKlab:

Touch **Build**.

Continue to step 1.

B. Within a SPARKlab add a new page:

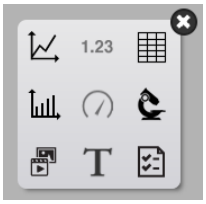
Touch the **New Page** button.

Continue to step 1.

1. Select a template from the library.

Scroll up and down to view templates

2. Touch a display type for each placeholder.



Line Graph

Digits

Table

Bar Graph

Meter

Camera

Media

Text

Assess-ment

3. For Text Boxes: Type in text into the Text Box.
4. For Cameras: Touch the **Image Tools** button. See Capturing a camera image.
5. For other data displays: Select the data for each display on the page.

a. Touch the display data label(s), for example: **Select Measurement**, **X-Axis Variable**, Y-Axis Variable, **Select a Media File**, Add an Assessment

or

b. Open the display properties and select the data.

   i. Touch the **Display Tools** button near the lower or upper left corner of the display.

   ii. Touch the **Properties** button.

Add additional pages:

Repeatedly click the **New Page** button to add pages to your SPARKlab.

3 Setting up an experiment

- "Customizing data collection": 12
- "Customizing how numbers are displayed": 14
- "Calibrating sensors": 16
- "Using sensor adapters": 19

Customizing data collection

You can start recording data using the default settings, or complete one or more of the following tasks to change the sampling rate or sampling mode.

- "Setting the sample rate": 12
- "Putting SPARKvue into periodic sampling mode": 12
- "Putting SPARKvue into manual sampling mode": 13
- "Setting an automatic stop condition": 13

Setting the sample rate

With SPARKvue in periodic sampling mode (the default mode), complete these steps to set how many data points are recorded each second or how much time elapses between data points:

1. Click the **Sampling Options** button.

2. The **Sampling Options** screen opens.
3. Click the **Sample Rate** box and click a value.
4. Click the **Sample Rate Unit** box and click **Hz**, **seconds**, **minutes**, or **hours**.
5. Click **OK**.

Putting SPARKvue into periodic sampling mode

In periodic sampling mode (the default mode, sometimes known as “continuous” mode), SPARKvue records data points at regular intervals. If SPARKvue is in manual sampling mode, complete these steps to put it into periodic sampling mode:

1. Click the **Sampling Options** button.

   The **Sampling Options** screen opens.
2. Click **Periodic**.
3. Click **OK**.

Putting SPARKvue into manual sampling mode

In manual sampling mode, a single value from each measurement is recorded each time you manually trigger SPARKvue. Complete these steps to put SPARKvue into manual sampling mode:

1. Click the **Sampling Options** button.

   The **Sampling Options** screen opens.
2. Click **Manual**.
3. Click **OK**.

Setting an automatic stop condition

When a stop condition is set, SPARKvue automatically stops recording data after a set time interval.

Complete these steps to set a stop condition:

1. Click the **Sampling Options** button.

   The **Sampling Options** screen opens.
2. Under **Automatic Stop Condition:**, click the **Condition:** box and click **Stop after duration**.
3. Click the **Value** box and enter a time value.
4. Click the **Units** box and click units of time.
5. Click **OK**.

Customizing how numbers are displayed

- "Setting the number of decimal places displayed": 14
- "Setting the number of significant figures displayed": 14
- "Displaying numbers in scientific notation": 15
- "Changing the units of a measurement": 15

Setting the number of decimal places displayed

1. Click the **Experiment Tools** button.

   The Experiment Tools screen opens.
2. Click **Data Properties**.

   The **Data Properties** screen opens.
3. Click the **Measurement** box and click a measurement or other variable.
4. Click the **Number Style** box and click **Fixed Precision**.
5. Click the **Digits** box and select the number of digits to be displayed after the decimal point.
6. Click **OK**.

Setting the number of significant figures displayed

1. Click the **Experiment Tools** button.

   The Experiment Tools screen opens.
2. Click **Data Properties**.

   The **Data Properties** screen opens.
3. Click the **Measurement** box and click a measurement or other variable.
4. Click the **Number Style** box and click **Significant Figures**.
5. Click the **Digits** box and select the number of significant figures to be displayed.
6. Click **OK**.

Displaying numbers in scientific notation

1. Click the **Experiment Tools** button.

2. Click **Data Properties**.

   The **Data Properties** screen opens.
3. Click the **Measurement** box and click a measurement or other variable.
4. Click **Number Format**.

   The number format options appear.
5. Click the **Number Style:** box and click **Scientific Notation**.
6. Click the **Digits** box and select the number of digits to be displayed.
7. Click **OK**.

Changing the units of a measurement

Do one or both of the following tasks to select different units for a measurement.

- **"Changing the units of a measurement in an existing display": 15**
- **"Changing the default units of a measurement": 16**

Changing the units of a measurement in an existing display

Complete these steps to change the units of a measurement displayed in an existing graph, digits display, table, or meter:

1. Click the **Measurement** button to change; skip to step 4.
2. Or, click the applicable **Display Tools** button to open the tools palette.

3. Click the **Properties** button to open the **Properties** screen.

4. Click the **Units** box and select a unit of measure.

5. Click **OK**.

   The display shows the measurement with the selected units.

Changing the default units of a measurement

Complete these steps to change the units that will be used by default when you select a measurement in the future:

1. Click the **Experiment Tools** button to open the Experiment Tools screen.

   Note: The **Experiment Tools** button is visible in data collection mode.
2. Click **Data Properties** to open the **Data Properties** screen.
3. Click the **Measurement** box and select a measurement.
4. Click the **Units** box and select units of measure.
5. Click **OK**.

   The next time you select that measurement for display, it will appear with the units that you selected.

Calibrating sensors

Sensor calibration is an optional step that can help to make measurements more accurate.

Complete the following tasks to select a measurement and calibration type and perform a calibration.

1. "Selecting a measurement to calibrate and a calibration type": 16
2. "Performing a calibration": 17

Selecting a measurement to calibrate and a calibration type

1. Click the **Experiment Tools** button.

   The Experiment Tools screen opens.
2. Click **Calibrate Sensor**.

   The **Calibrate Sensor: Select Measurement** screen opens.
3. Click the **Sensor** box and click the sensor to be calibrated.

4. Click the **Measurement** box and click the measurement to be calibrated.
5. Click the **Calibration Type** box and click a calibration type.

   See the instructions provided with your sensor for information about what type of calibration is appropriate for your sensor.
6. Click **Next**.

   The **Calibrate Sensor Enter Values** screen opens.
7. Continue to "Performing a calibration": 17.

Performing a calibration

After you have selected a measurement to be calibrated and a calibration type (see previous task), you are ready to perform a calibration.

Depending on the calibration type that you have selected, perform a 2-point calibration, a 1-point offset-only calibration, or a 1-point slope-only calibration.

- **"Performing a 2-point calibration": 17**
- **"Performing a 1-point offset-only calibration": 18**
- **"Performing a 1-point slope-only calibration": 18**
- **"Calibrating a Drop Count sensor (example)": 18**

Performing a 2-point calibration

In the **Calibrate Sensor Enter Values** screen, complete these steps:

1. Apply a known quantity to the sensor. For example, place a pH probe in a pH 4 buffer solution.
2. Under **Calibration Point 1**Click the **Standard Value** box and enter the known value.

   For example, enter the known pH of the buffer solution.
3. Under **Calibration Point 1**Click **Read From Sensor**.

   The value measured by the sensor is transferred to the **Sensor Value** box.
4. Apply a different known quantity to the sensor. For example, place the pH probe in a pH 7 buffer solution.
5. Under **Calibration Point 2**Click the **Standard Value** box and enter the known value. For example, enter the known pH of the buffer solution.
6. Under **Calibration Point 2**Click **Read From Sensor**. The value measured by the sensor is transferred to the **Sensor Value** box.
7. Click **OK**.

   Calibration is complete.

Performing a 1-point offset-only calibration

In the **Calibrate Sensor Enter Values** screen, complete these steps:

1. Apply a known quantity to the sensor. For example, place a temperature probe in ice water known to be 0 °C.
2. Under **Calibration Point 1** Click the **Standard Value** box and enter the known value.

   For example, enter the known temperature of the water.
3. Under **Calibration Point 1** Click **Read From Sensor**.

   The value measured by the sensor is transferred to the **Sensor Value** box.
4. Click **OK**.

   Calibration is complete.

Performing a 1-point slope-only calibration

In the **Calibrate Sensor Enter Values** screen,complete these steps:

1. Apply a known quantity to the sensor. For example, place a dissolved oxygen probe in a bottle known to contain 9.1 mg/L of dissolved oxygen.
2. Under **Calibration Point 2** Click the **Standard Value** box and enter the known value.

   For example, enter the known dissolved oxygen concentration.
3. Under **Calibration Point 2** Click **Read From Sensor**.

   The value measured by the sensor is transferred to the **Sensor Value** box.
4. Click **OK**.

   Calibration is complete.

Calibrating a Drop Count sensor (example)

Tip: The Drop Dispenser has two stopcocks. The top stop cock is used to regulate flow rate and the bottom stopcock is used to turn the flow on and off. The bottom stopcock should either be in the completely open or completely closed position.

The drop counter is calibrated, using the SPARKvue Experiment Tools to correlate the number of drops counted to the volume of liquid dispensed from the Drop Dispenser.

1. Attach the Drop Dispenser (syringe, two stopcocks and drop tip) to a support rod.
2. Fill the syringe with titrant.
3. Open both stopcock valves and adjust the valve on the top stopcock so that the drops fall at a rate of about 1 drop per second. Close the bottom valve after the rate is achieved.
4. Connect the Drop Counter and launch SPARKvue.

5. Align the drop tip with the opening in the Drop Counter. Put a graduated 10 mL cylinder under the Drop Counter opening.
6. While on the Home screen, open the bottom stopcock to allow titrant to flow.
7. After about 10 mL of titrant is collected in the graduated cylinder, close the bottom stopcock.
8. Record the exact volume from the graduated cylinder.
9. Build the desired display for you experiment.
10. Click the Experiment Tools button.

    The Experiment Tools screen opens.
11. Click Calibrate Sensor.

    The Calibrate Sensor: Select Measurement screen opens.
12. the Sensor: box and select **Drop Counter**.
13. Click the Measurement: box and select **Fluid Volume (ml)**.
14. Click the Calibration Type: box and select 1 point (Adjust Slope Only).
15. Click NEXT.

    The Calibrate Sensor screen opens.
16. Under Calibration Point 2 click the Standard Value: box and enter the recorded volume (from step 8).
17. Under Calibration Point 2 click Read From Sensor.
18. Click OK to exit the Calibrate Sensor screen.
19. Click OK to exit the Experiment Tools screen.

Using sensor adapters

- "Connecting a sensor through a Digital Adapter or Photogate Port": 19
- "Connecting a sensor through an Analog Adapter": 20

Connecting a sensor through a Digital Adapter or Photogate Port

The Digital Adapter (PASCO part PS-2159) allows digital switch-type sensors such as photogates and smart pulleys to be connected to a PASPORT interface and used with SPARKvue. It also allows the use of a *ScienceWorkshop* Motion Sensor (CI-6742A) or Rotary Motion Sensor (CI-6538).

The Photogate Port (PS-2123) is a type of adapter that supports switch-type sensors, but not the Rotary Motion Sensor or Motion Sensor.

Complete these steps to connect and configure a sensor with a Digital Adapter or Photogate Port:

1. Connect the adapter to your PASPORT interface.
2. Connect a digital sensor to the adapter.

   You can connect a switch-type sensor to either port of the adapter.

   If you are connecting a Motion Sensor or Rotary Motion Sensor, connect the yellow plug to Port 1 and the black plug to Port 2. A list of digital sensors and sensor configurations appears.
3. Optionally, connect a second switch-type sensor to the other port of the adapter.
4. In the list, click one of the sensors or configurations to select it and click **OK**.

   You may need to click the arrows to scroll the list.
5. If SPARKvue prompts you to enter one or more measurements specific to your equipment, enter the value or values and click **OK**. The measurements that you enter will be used to compute data such as the velocity of an object passing through a photogate.

Connecting a sensor through an Analog Adapter

The Analog Adapter (PASCO part PS-2158) allows analog *ScienceWorkshop* sensors to be connected to a PASPORT interface and used with SPARKvue.

Complete these steps to connect and configure a sensor with an Analog Adapter:

1. Connect the Analog Adapter to your PASPORT interface.
2. Connect an analog sensor to the adapter.

   A list of sensors appears.
3. Click one of the sensors to select it and click **OK**.

   You may need to click the arrows to scroll the list.
4. Optionally, click the **Gain** box and click a gain setting.
5. Click **OK** again.

4 Data recording

The following tasks describe how to record a data run with SPARKvue in periodic sampling mode and manual sampling mode.

Note: Over the course of a science investigation, you can record multiple data runs and sets.

- "Recording a run of periodically sampled data": 21
- "Recording a set of manually sampled data": 21
- "Deleting data runs": 22

Recording a run of periodically sampled data

To record manually sampled data, first put SPARKvue into periodic sampling mode.

With SPARKvue in periodic sampling mode (the default mode, sometimes known as "continuous" mode), complete these steps to record a data run:

1. Click the **Start** button.

   SPARKvue creates a new data run and starts recording data points into it.
2. To stop recording data, click the **Stop** button.

   SPARKvue stops recording data.
3. Repeat these steps to record another data run.

Recording a set of manually sampled data

To record manually sampled data, first put SPARKvue into manual sampling mode.

In manual sampling mode, a single value from each measurement is recorded each time you manually trigger SPARKvue. A series of values is recorded in a data set.

Complete these steps to start a data set, trigger points to be recorded, and close the data set:

1. Optionally, turn to a page in your SPARKlab where you will be able to see your data in a table.

You can record data with any type of display visible (or no display at all), but it is typical to record manually sampled data while looking at a table.

2. Click the **Start** button.

SPARKvue creates a new data set. Live data appear in the data displays.

3. When you are ready to record a data point, click the **Keep** button.

SPARKvue records a single value from each measurement.

4. Repeat the previous step as many times as necessary to record all of the data that you want in the data set.
5. When the entire set has been recorded, click the **Stop** button.

The data set closes.

6. Repeat these steps to record another data set.

Deleting data runs

1. Click the **Experiment Tools** button.

The Experiment Tools screen opens.

2. Click **Manage Data**.
3. Click **Manage Runs**.

   The **Manage Runs** screen opens.

4. Do one of the following:
   - Click **Delete Last Run**.
   - Click **Delete All Runs**.
   - Click **Delete Run…** and click the run that you want to delete.
5. Click **Done**.
6. Click **OK**.

5 Data display

- "Displaying data in a line graph": 23
- "Displaying data in a bar graph": 34
- "Displaying data in a Multiple y-axis graph": 31
- "Displaying data in a table": 44
- "Displaying data in a digits display": 50
- "Displaying data in a meter": 52

Displaying data in a line graph

- "Creating a new line graph": 23
- "Showing and hiding the line graph tool palette": 25
- "Adjusting the scale of a line graph": 25
- "Selecting data to show in an existing line graph": 26
- "Selecting data for operation in a line graph": 28
- "Annotating data in a line graph": 30
- "Displaying data in a Multiple y-axis graph": 31

Creating a new line graph

To create a new line graph, do one of the following (A or B):

A. From the Home screen create a new SPARKlab:

Touch **Build**.

Continue to step 1.

B. Within a SPARKlab add a new page:

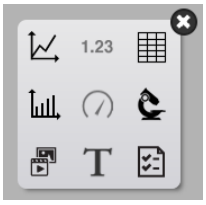
Touch the **New Page** button.

Continue to step 1.

1. Select a template from the library.

Scroll up and down to view templates

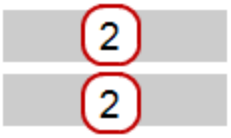
The **Display Selection** opens for each placeholder.



2. Touch the Line Graph icon.

Note: Tables and graphs are disabled for some page configurations.

Examples:



1 Disabled for tables and graphs

2 Enabled

3. Select the data for each display on the page.

a. Touch the display data label(s): **Select Measurement**

or

b. Open the display properties and select the data.

i. Touch the **Display Tools** button near the lower or upper left corner of the display.

ii. Touch the **Properties** button.

Showing and hiding the line graph tool palette

Show: To show the tool palette, touch the **Display Tools** button near the lower or upper left corner of the display.

Hide: To hide the tool palette, touch the **Display Tools** button.

Adjusting the scale of a line graph

Do one or more of the following tasks (in any order) to change the range and domain of a graph.

- **"Scaling a graph to fit all data": 25**
- **"Scaling by direct manipulation": 26**

Scaling a graph to fit all data

1. Click the **Graph Tools** button to open the tool palette.

2. Click the **Scale-to-fit** button.

The graph adjusts to fit all data (or selected data).

Scaling by direct manipulation

Complete one or more of these steps in any order:

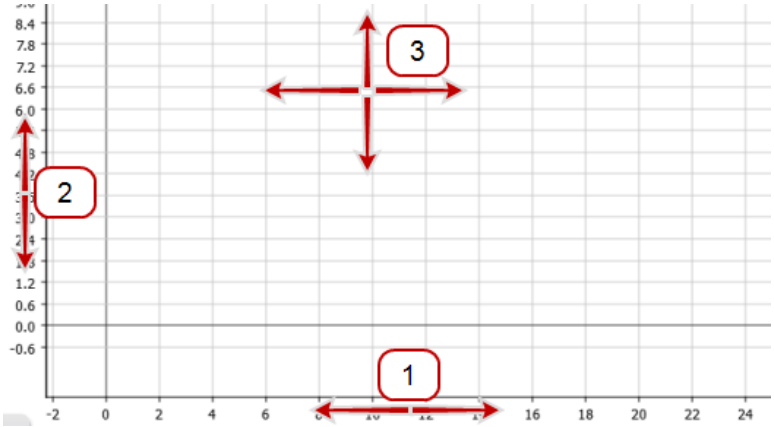
- Click one of the numbers labeling the x-scale of the graph and drag it left or right.

  The graph expands or contracts horizontally.
- Click one of the numbers labeling the y-scale of the graph and drag it up or down.

  The graph expands or contracts vertically.
- Click the middle of the graph and drag it in any direction.

  The graph moves.

1 Expanding and contracting horizontally. 2 Expanding and contracting vertically. 3 Moving.



Selecting data to show in an existing line graph

- "Showing and hiding data runs in a graph": 26
- "Changing the variable on the x- or y-axis": 27

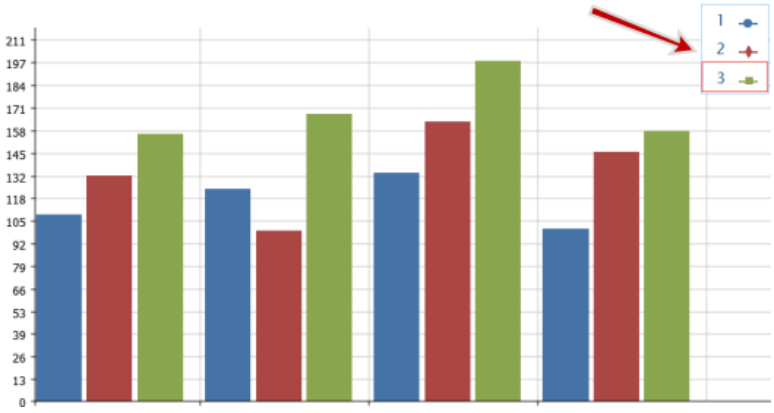
Showing and hiding data runs in a graph

1. Click the graph legend.

   The legend enlarges to show available data runs.

2. Select or clear (Click) the check box next to each data run that you want to show or hide.
3. Optionally, click outside the legend to reduce the size of the legend.

Graph legend



Changing the variable on the x- or y-axis

1. Click the **Measurement** button to change; skip to step 4.
2. Or, click the applicable **Display Tools** button to open the tools palette.

3. Click the **Properties** button to open the **Properties** screen.

4. Click the display variable you want to change.
5. Click the **Measurement** box and click the replacement measurement or other variable.
6. Click **OK**.

Selecting data for operation in a line graph

- "Selecting a data run for operation in a line graph": 28
- "Selecting part of a data run for operation in a line graph": 28

Selecting a data run for operation in a line graph

In the display legend, a red outline surrounds the run that is selected for operation. Complete these steps to change which run is selected:

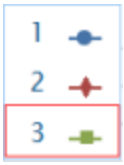
i. Click the legend.

   The legend enlarges.

ii. In the legend, click the symbol (but not the check box) of the run that you want to select.

   The red outline moves to the selected run.

   Sample Legend



   Note: When you apply statistics, such as mean or standard deviation, they are applied to the selected run.

Selecting part of a data run for operation in a line graph

If part of a data run is selected for operation, the selected data points are highlighted. Scale-to-fit, statistics, graph tools, and curve fits are applied only to the selected data points.

Complete these steps to select part of a data run:

1. Optional: select a different data run.

   In the display legend, a red outline surrounds the run that is selected for operation.

Complete these steps to change which run is selected:

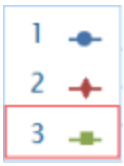
i. Click the legend.

The legend enlarges.

ii. In the legend, click the symbol (but not the check box) of the run that you want to select.

The red outline moves to the selected run.

Sample Legend



Note: When you apply statistics, such as mean or standard deviation, they are applied to the selected run.

2. Click the **Graph Tools** button to open the tool palette.

3. Click the **Select** button.

The button changes color.

4. Click and drag to select data points.
5. When the desired data points are highlighted, click **done selecting**.
6. To clear the selection, click the **Select** button again.

Annotating data in a line graph

- "Adding an annotation": 30
- "Editing or deleting an annotation": 31

Adding an annotation

1. If there is more than one data run on the line graph, first select the run that the annotation will be attached to:
   a. Click the graph legend.

      The legend enlarges.

   b. In the legend, click the symbol of the run that you want to select.

      The red outline moves to the selected run.
2. Click the **Graph Tools** button to open the tool palette.

3. Click the **Select** button.

   The button changes color.

4. Click one or points on the graph.
5. Click **done selecting**.
6. Click the **Annotation** button.

7. Enter a note and click **OK**.

An annotation appears on the graph. You can then click and the move the annotation.

8. Click the **Select** button.

Editing or deleting an annotation

1. Click the **Graph Tools** button to open the tool palette.

2. Click the annotation that you want to edit or delete.

   The annotation is highlighted.

3. Click the **Annotation** button.

   The on-screen keyboard appears.

4. Edit or delete the annotation and click **OK**.

   If you delete all the text, the annotation is removed.

   If you change the text, the new text appears in the annotation box on the bar graph.

Displaying data in a Multiple y-axis graph

- **"Creating a multiple y-axes line graph": 31**
- **"Working with multiple y-axes": 34**

Creating a multiple y-axes line graph

To create a new line graph with multiple y-axes:

I. Create a line graph (or use an existing line graph)

II. "Add a vertical axis:": 33

To create a line graph, do one of the following (A or B):

A. From the Home screen create a new SPARKlab:

Touch **Build**.

Continue to step 1.

B. Within a SPARKlab add a new page:

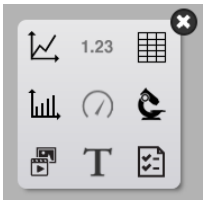
Touch the **New Page** button.

Continue to step 1.

1. Select a template from the library.

Scroll up and down to view templates

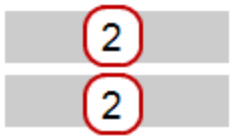
The **Display Selection** opens for each placeholder.



2. Touch the Line Graph icon.

Note: Tables and graphs are disabled for some page configurations.

Examples:



1 Disabled for tables and graphs

2 Enabled

3. Select the data for each display on the page.

a. Touch the display data label(s): **Select Measurement**

or

b. Open the display properties and select the data.

i. Touch the **Display Tools** button near the lower or upper left corner of the display.

ii. Touch the **Properties** button.

Add a vertical axis:

1. Open the properties.

i. Touch the **Display Tools** button near the lower or upper left corner of the display.

ii. Touch the **Properties** button.

2. Click **Add Vertical Axis**.
3. Click **Measurement** and select the second measurement.

Note: Axis **y1** is the outside axis and **y2** is the inside axis.

4. Click **OK**.

A graph with multiple y-axes displays.

Working with multiple y-axes

Most of the actions you can perform on a single y-axis graph can be performed on multiple y-axes graphs. You can:

- "Adjusting the scale of a line graph": 25
- "Selecting data to show in an existing line graph": 26
- "Selecting data for operation in a line graph": 28
- "Annotating data in a line graph": 30

Displaying data in a bar graph

- "Creating a new bar graph": 34
- "Showing and hiding the bar graph tool palette": 36
- "Showing data in bar graphs": 36
- "Annotating data in bar graphs": 40
- "Viewing bar graphs": 42
- "Customizing axes labels and units on bar graphs": 44

Creating a new bar graph

To create a new bar graph, do one of the following (A or B):

A. From the Home screen create a new SPARKlab:

Touch **Build**.

Continue to step 1.

B. Within a SPARKlab add a new page:

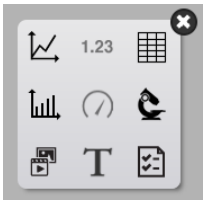
Touch the **New Page** button.

Continue to step 1.

1. Select a template from the library.

Scroll up and down to view templates

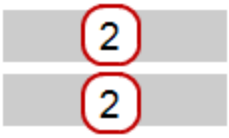
The **Display Selection** opens for each placeholder.



2. Touch the Bar Graph icon.

Note: Tables and graphs are disabled for some page configurations.

Examples:



1 Disabled for tables and graphs

2 Enabled

3. Select the data for each display on the page.

a. Touch the display data label(s): **X-Axis Variable**, Y-Axis Variable

or

b. Open the display properties and select the data.

i. Touch the **Display Tools** button near the lower or upper left corner of the display.

ii. Touch the **Properties** button.

Showing and hiding the bar graph tool palette

Show: To show the tool palette, touch the **Display Tools** button near the lower or upper left corner of the display.

Hide: To hide the tool palette, touch the **Display Tools** button.

Showing data in bar graphs

When you create a new bar graph, the first bar is already created for you. You will need to name the bar and add additional bars in your bar graph and record data for each bar.

- **"Adding bars and bar names in bar graphs": 36**
- **"Editing bars and bar names in bar graphs": 37**
- **"Adding data in bar graphs": 37**
- **"Adding additional data runs to a bar graph": 38**
- **"Adding additional data runs to a bar graph using sensor readings": 39**
- **"Showing and hiding data runs in a bar graph": 39**
- **"Selecting data for operation in a bar graph": 40**

Adding bars and bar names in bar graphs

1. Click the placeholder bar. This will open the bar edit menu. A placeholder bar appears in the bar graph.

Note: this tool will already be active when a bar graph is first created.

2. Click the bar with muted color.
3. Click the default bar name above the numeric keypad, such as **Bar 1**
4. Click in the bar name box, delete the old name, and enter a new name.
5. Click **OK**.

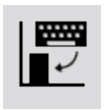
   A new placeholder bar is automatically added.
6. To name the new bar, click it, and repeat steps 2 through 4.
7. Continue adding the bars you need.
8. When you finish adding bars, click the Bar Add and Edit button to turn off the tool.

   Turning this tool off removes the last placeholder bar.

Editing bars and bar names in bar graphs

1. Open Properties:
   i. Touch the **Display Tools** button near the lower or upper left corner of the display.
   ii. Touch the **Properties** button.

2. Click the **Bar Edit** button.



3. Click the bar you want to edit.

   The bar edit menu opens.
4. Click in the bar name box, delete the old name, and enter a new name.
5. Click **OK**.

Adding data in bar graphs

You can add data to bars either manually or through collecting data using a sensor.

- **"Entering data into bar graph manually": 38**
- **"Collecting data for bar graph using a sensor": 38**

Entering data into bar graph manually

1. Click the **Bar Graph Tools** button to open the tool palette.

2. Click the bar you want to edit.
3. Enter a value for the bar.
4. Click **OK**.

Collecting data for bar graph using a sensor

It is recommended that the bars are given names either before or during data collection. See Editing bars and bar names in bar graphs and "Adding bars and bar names in bar graphs": 36.

1. Click the record arrow to record data for the first empty bar in a data run.

The first bar becomes active and displays the data being collected, and the record button changes to a check mark.

2. Click the check mark to stop collecting for the current bar and move to the next bar.

Note: The will remains gray if it does not have a name assigned to it.

3. Click the Stop button to stop collecting data.

Adding additional data runs to a bar graph

You can show multiple data sets in a bar graph at once.

1. If necessary, click the **Bar Graph Tools** button near the lower left corner of the bar graph to open the tool palette.

2. For manually entered data, click the **Run Addition** button.

3. Enter or record the data for each bar.

Adding additional data runs to a bar graph using sensor readings

You can show multiple data sets in a bar graph at once.

1. For data collected using a sensor, click the **Record Arrow**.

2. Click the **Check mark** to stop collecting for the current bar and move to the next bar.

Note: the bar will remain gray if it does not have a name assigned to it.

3. Click the **Stop** button to stop collecting data.

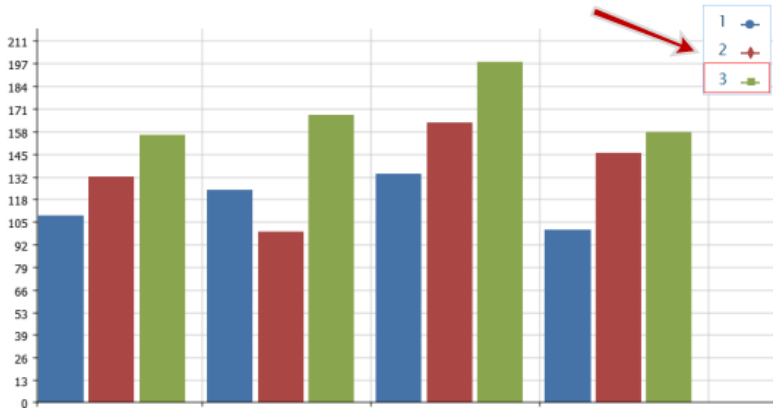
Showing and hiding data runs in a bar graph

1. Click the graph legend.

   The legend enlarges to show available data runs.

2. Select or clear (Click) the check box next to each data run that you want to show or hide.
3. Optionally, click outside the legend to reduce the size of the legend.

Bar Graph legend



Selecting data for operation in a bar graph

In the display legend, a red outline surrounds the run that is selected for operation. Complete these steps to change which run is selected:

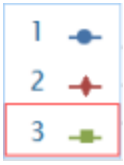
i. Click the legend.

The legend enlarges.

ii. In the legend, click the symbol (but not the check box) of the run that you want to select.

The red outline moves to the selected run.

Sample Legend



Note: When you apply statistics, such as mean or standard deviation, they are applied to the selected run.

Annotating data in bar graphs

You can add annotation and show numeric values on bars.

- "Adding annotations to bars": 41
- "Editing or deleting annotations to bars": 41
- "Showing numeric values on bars": 42

Adding annotations to bars

If there is more than one data run on the graph, first select the run that the annotation will be attached to:

1. Click the graph legend.

   The legend enlarges.

2. In the legend, click the symbol of the run(s) that you want to annotate.
3. click the **Bar Graph Tools** button to open the tool palette.

4. Click the **Annotation** button.

5. Click a bar.
6. Enter a note, and click **OK**.

   An annotation appears on the bar graph.

Editing or deleting annotations to bars

1. Click the **Graph Tools** button to open the tool palette.

2. Click the annotation that you want to edit or delete.

   The annotation is highlighted.
3. Click the **Annotation** button.

The **Enter Note** screen appears.

4. Edit or delete the annotation text, and click **OK**.

   If you delete all the text, the annotation is removed.

   If you change the text, the new text appears in the annotation box on the bar graph.

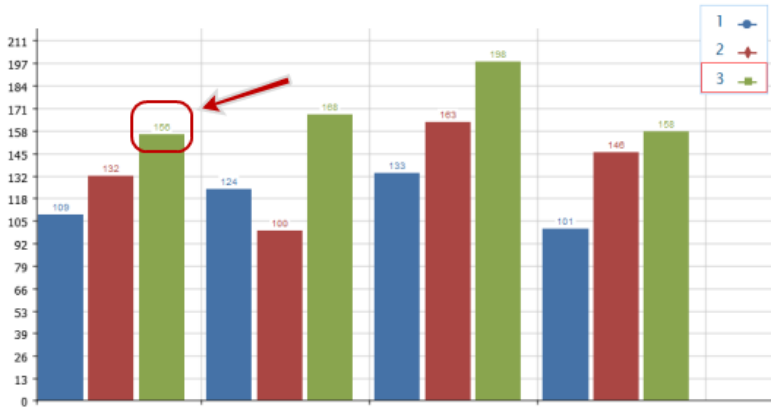
Showing numeric values on bars

To show numeric values at the tops of bars in a bar chart for a data run:

1. Click the **Bar Graph Tools** button to open the tool palette.

2. Click the **Numeric Values** button.

   Numeric values appear at the top of each bar.



3. Click the **Numeric Values** button to remove the numeric values.

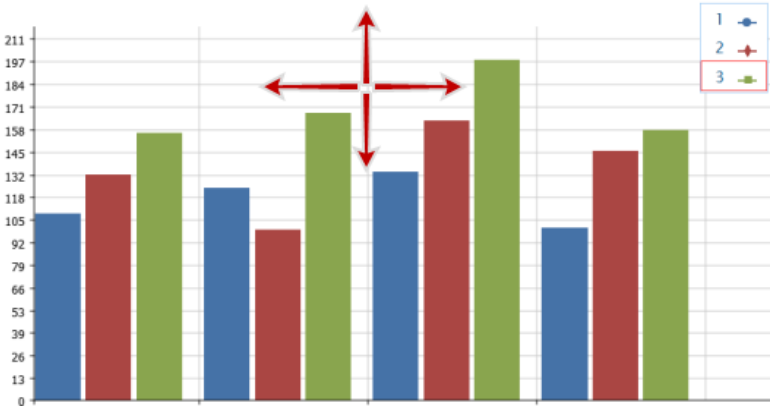
Viewing bar graphs

You can scroll and scale bar graphs to help you view all data in the graph:

- "Scrolling a bar graph": 43
- "Scaling a bar graph to show all data": 43
- "Scaling a bar graph by expanding or compressing the axes": 43

Scrolling a bar graph

To scroll and change the view of a bar graph, click the middle of the graph and drag it up, down, side-to-side, or diagonally.



Scaling a bar graph to show all data

1. Click the **Bar Graph Tools** button to open the tool palette.

2. Click the **Scale-to-fit** button.

The graph adjusts to fit all data (or selected data).

Scaling a bar graph by expanding or compressing the axes

You can change the scale of a bar graph by expanding or compressing the X-axis, Y-axis, or both.

To do this, complete one or both of the following actions:

- Click one of the labels on the X-axis and drag horizontally (left or right).

The graph expands or contracts horizontally, making each bar area wider or narrower.

- Click one of the labels on the Y-axis, and drag vertically (up or down).

The bars in the bar graph display larger or smaller depending on the scale adjustment.

Customizing axes labels and units on bar graphs

To create an axis label:

1. Open Properties:
   i. Touch the **Display Tools** button near the lower or upper left corner of the display.
   ii. Touch the **Properties** button.

2. Click the **Measurement** box for either the X-axis variable or Y-axis variable.
3. Click **User-entered**.
4. Click **Create Data Set**.
   The **Define Data Set** box displays.
5. Click the **Measurement Name** box.
6. Type the label text, and click **OK**.
7. Click the **Unit Name** box (if desired).
8. Type the type of unit, and click **OK**.
9. Click **OK**.
   The new axis label(s) and unit(s) display in your bar graph.

Displaying data in a table

- "Creating a table": 44
- "Showing and hiding the table tool palette": 46
- "Scrolling a table": 46
- "Selecting data to show in an existing table": 47
- "Selecting cells for operation in a table": 49

Creating a table

To create a table, do one of the following (A or B):

A. From the Home screen create a new SPARKlab:

Touch **Build**.

Continue to step 1.

B. Within a SPARKlab add a new page:

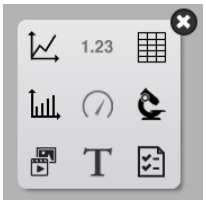
Touch the **New Page** button.

Continue to step 1.

1. Select a template from the library.

Scroll up and down to view templates

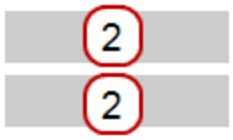
The **Display Selection** opens for each placeholder.



2. Touch the Table icon.

Note: Tables and graphs are disabled for some page configurations.

Examples:



1 Disabled for tables and graphs

2 Enabled

3. Select the data for each display on the page.

a. Touch the display data label(s): **Select Measurement**

or

b. Open the display properties and select the data.

i. Touch the **Display Tools** button near the lower or upper left corner of the display.

ii. Touch the **Properties** button.

Showing and hiding the table tool palette

Show: To show the tool palette, touch the **Display Tools** button near the lower or upper left corner of the display.

Hide: To hide the tool palette, touch the **Display Tools** button.

Scrolling a table

Click the middle of the table and drag it up or down.

1	5.0		114.5
2	7.0		123.2
3	8.0		109.4
4	10.0		133.2
5	12.0		99.4
6	14.0		181.2
7	16.0		141.2
8	18.0		108.1
9	20.0		137.5

Selecting data to show in an existing table

- "Selecting a run for display in an existing column": 47
- "Changing the variable displayed in an existing column": 47
- "Adding a column": 48
- "Removing a column": 48

Selecting a run for display in an existing column

1. Click the run number at the top of the column.

   A list of available runs appears.
2. Click the run that you want to see.

Changing the variable displayed in an existing column

1. Click the **Measurement** button to change; skip to step 4.
2. Or, click the **Display Tools** button to open the tools palette.

3. Click the **Properties** button to open the **Properties** screen.

4. Click the display variable you want to change.

   Note: For tables, columns are number 1, 2, 3, *etc.* from left to right.
5. Click the **Measurement** box and click the replacement measurement or other variable.
6. Click **OK**.

Adding a column

A table can contain up to six columns. Complete these steps to add a column to a table:

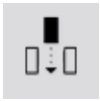
1. Click the **Table Tools** button to open the tool palette.

2. Optionally, click a position in the table where the new column will be inserted:
   a. Click the **Select** button.

   The button changes color.

   b. Click the column to the right of where you want the new column to appear.

   Note: If you do not click a position, the new column will be added to the right side of the table.
3. Click the **Add Column** button.



   A new, empty column is added to the table.
4. Click the **Select Measurement** button to select a measurement or other variable to display in the new column.

Removing a column

1. Click the **Table Tools** button to open the tool palette.

2. Click the **Select** button.

   The button changes color.

3. Click the column that you want to remove.

4. Click the **Remove Column** button.

5. Click **OK**.

Selecting cells for operation in a table

If a group of table cells is selected for operation, the selected cells are outlined. If statistics are displayed, they apply only to the data in the selected cells.

Complete these steps to select cells:

1. Optional: select a different data run.

   In the display legend, a red outline surrounds the run that is selected for operation. Complete these steps to change which run is selected:

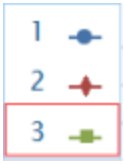
   i. Click the legend.

   The legend enlarges.

   ii. In the legend, click the symbol (but not the check box) of the run that you want to select.

   The red outline moves to the selected run.

   Sample Legend



   Note: When you apply statistics, such as mean or standard deviation, they are applied to the selected run.

2. Click the **Table Tools** button to open the tool palette.

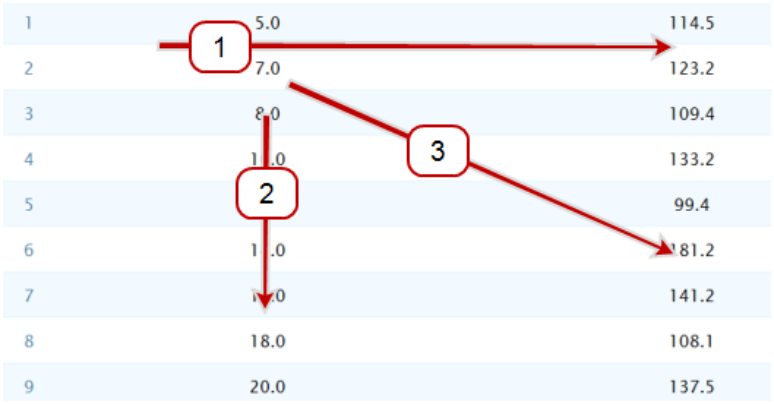
3. Click the **Select** button.

The button changes color.

4. On the table, drag down a column, across a row, or diagonally across rows and columns to select a group of cells.

The selected group of cells is outlined.

1 Selecting cells in a single column. 2 Selecting cells in a single row. 3 Selecting cells in multiple columns and rows.



5. To clear the selection, click the **Select** button again.

Displaying data in a digits display

- "Creating a new digits display": 50
- "Showing and hiding the digits display tool palette ": 52
- "Changing the variable in a digits display": 52

Creating a new digits display

1.23 To create a new digits display, do one of the following (A or B):

A. From the Home screen create a new SPARKlab:

Touch **Build**.

Continue to step 1.

B. Within a SPARKlab add a new page:

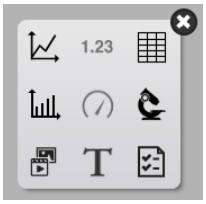
Touch the **New Page** button.

Continue to step 1.

1. Select a template from the library.

Scroll up and down to view templates

The **Display Selection** opens for each placeholder.



2. Touch the Digits icon.

3. Select the data for each display on the page.

a. Touch the display data label(s): **Select Measurement**

or

b. Open the display properties and select the data.

   i. Touch the **Display Tools** button near the lower or upper left corner of the

display.

ii. Touch the **Properties** button.

Showing and hiding the digits display tool palette

Show: To show the tool palette, touch the **Display Tools** button near the lower or upper left corner of the display.

Hide: To hide the tool palette, touch the **Display Tools** button.

Changing the variable in a digits display

1. Click the **Measurement** button to change; skip to step 4.
2. Or, click the **Display Tools** button to open the tools palette.

3. Click the **Properties** button to open the **Properties** screen.

4. Click the display variable you want to change.
5. Click the **Measurement** box and click the replacement measurement or other variable.
6. Click **OK**.

Displaying data in a meter

- "Creating a new meter": 53
- "Showing and hiding the meter tool palette": 54

- "Adjusting the scale of a meter": 54
- "Changing the variable displayed in a meter": 55
- "Customizing the appearance of a meter": 56

Creating a new meter

To create a new meter, do one of the following (A or B):

A. From the Home screen create a new SPARKlab:

Touch **Build**.

Continue to step 1.

B. Within a SPARKlab add a new page:

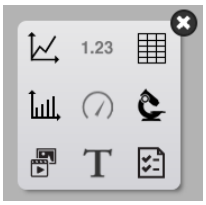
Touch the **New Page** button.

Continue to step 1.

1. Select a template from the library.

Scroll up and down to view templates

The **Display Selection** opens for each placeholder.



2. Touch the Meter icon.

3. Select the data for each display on the page.

a. Touch the display data label(s): **Select Measurement**

or

b. Open the display properties and select the data.

i. Touch the **Display Tools** button near the lower or upper left corner of the display.

ii. Touch the **Properties** button.

Showing and hiding the meter tool palette

Show: To show the tool palette, touch the **Display Tools** button near the lower or upper left corner of the display.

Hide: To hide the tool palette, touch the **Display Tools** button.

Adjusting the scale of a meter

- "Scaling a meter to fit all data": 55
- "Setting the scale of a meter": 55

Scaling a meter to fit all data

1. Click the **Meter Tools** button to open the tool palette.

2. Click the **Scale-to-fit** button.

The scale adjusts to fit all data for the currently displayed data run.

Setting the scale of a meter

1. Click the **Meter Tools** button to open the tool palette.

2. Click the **Properties** button to open the **Properties** screen.

3. For the **Always Scale to Fit:** option click **Off**.
4. Click the **Minimum:** box and enter the low value of the desired range.
5. Click the **Maximum:** box and enter the high value of the desired range.
6. Click **OK**.

Changing the variable displayed in a meter

1. Click the **Measurement** button to change; skip to step 4.
2. Or, click the **Display Tools** button to open the tools palette.

3. Click the **Properties** button to open the **Properties** screen.

4. Click the display variable you want to change.
5. Click the **Measurement** box and click the replacement measurement or other vari-

able.

6. Click **OK**.

Customizing the appearance of a meter

1. Open Properties:
   i. Touch the **Display Tools** button near the lower or upper left corner of the display.
   ii. Touch the **Properties** button.

2. Click the **Sweep Range:** box and click **Semicircle**, **Small Sweep**, or **Large Sweep**.
3. Click **OK**.

6 Image capture

- "Connecting a camera or other video device": 57
- "Displaying a camera image": 58
- "Showing and hiding the image tool palette": 59
- "Capturing a camera image": 60
- "Switching between live and captured camera images": 60
- "Selecting a captured camera image for display": 61
- "Adjusting the scale and position of a camera image": 61
- "Measuring in a camera image": 62
- "Drawing on a camera image": 65
- "Annotating a camera image": 67
- "Naming an image": 70
- "Deleting and Renaming an image": 70
- "Exporting an image": 71

Connecting a camera or other video device

Connect the camera or other imaging device to your computer. If your computer has a built in camera, it will be detected automatically.

On the Home screen, you will see the camera(s) appear in the Sensors list.

Creating a new camera image

To create a new camera image, do one of the following (A or B):

A. From the Home screen create a new SPARKlab:

Touch **Build**.

Continue to step 1.

B. Within a SPARKlab add a new page:

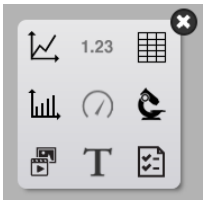
Touch the **New Page** button.

Continue to step 1.

1. Select a template from the library.

Scroll up and down to view templates

The **Display Selection** opens for each placeholder.



2. Touch the Camera icon.

Displaying a camera image

From the Home screen

1. In the Home screen, click an **Image** measurement.
   When selected, **Image** is highlighted in color.
2. Click **Show**.

A camera image display appears in a SPARKlab.

3. Click the **Live Image** button at the center of the display.

A live camera view appears in the display.

From within a SPARKlab

1. Click the **New Page** button.

The build a new page screen opens.

2. Select a template. See "Starting a new SPARKlab page": 94
3. Click the **Live Image** button at the center of the display.

   A camera image display appears in a SPARKlab.
4. Click the **Live Image** button at the center of the display.

A live camera view appears in the display.

Showing and hiding the image tool palette

Show: To show the tool palette, touch the **Display Tools** button near the lower or upper left corner of the display.

Hide: To hide the tool palette, touch the **Display Tools** button.

Capturing a camera image

See "Creating a new camera image": 57 to add a new page with a Camera element.

On the page, perform the following to capture an image:

1. Click the **Image Tools** button to open the tool palette.

2. Click the **Live Image** button on the tool palette to show a live image if a live image is not displayed.

   A live image must be showing before you can capture a still image.

   When a live image is showing, the button changes color.

3. Click the **Capture** button to capture a still image.

   The live image is replaced by the captured still image.

Switching between live and captured camera images

To switch from a captured still image back to a live image:

1. Click the **Image Tools** button to open the tool palette.

2. Click the **Live Image** button in the tool palette.

   The still image is replaced with a live image.

   The **Live Image** button changes color.

To switch from a live image to a previously captured still image:

1. Click the image legend.
   The legend expands to show all captured images.

2. Click the image to display.

Selecting a captured camera image for display

1. Click the image legend.
2. The legend expands to show a list of captured images.

3. Click the image to display.

Adjusting the scale and position of a camera image

Zooming in

In the tool palette, click the **Zoom In** button.

The display zooms in toward the center.

Zooming out

In the tool palette, click the **Zoom Out** button.

The display zooms in toward the center.

Scale to fit

To show the entire image, click the **Scale-to-fit** button.

Panning a camera image

You can view different parts of an image by panning, or click a point on the image and drag it left, right, diagonal, up, or down.

Measuring in a camera image

You can use a measurement tool on an image to measure the distance between two points. By default, the distance is reported in pixels (px), but you can calibrate the measurement tool to report the distance in other units.

The following topics describe how to position and calibrate measurement tools.

- **"Placing a Measurement tool": 62**
- **"Moving a Measurement tool": 63**
- **"Deleting a Measurement tool": 64**
- **"Calibrating camera image measurements": 64**

Placing a Measurement tool

While displaying a still image, complete the following steps.

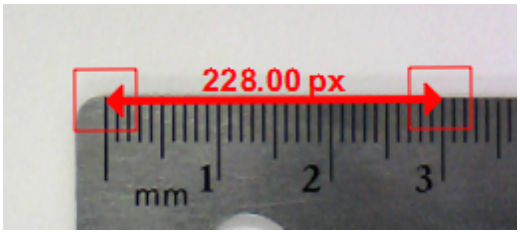
1. Click the **Image Tools** button to open the tool palette.

2. In the tool palette, click the **Measurement** button.

3. Optional: click the color button in the palette to change the color.

4. Click the point on the image.
5. Drag the box to the other point in the image.

A leader line with length display on the image.



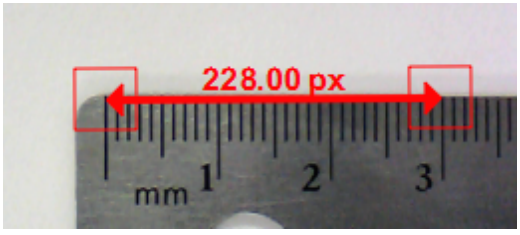
6. If necessary, drag the ends of the measurement tool to the desired location.
7. You can add additional measurement arrows, if needed.

Moving a Measurement tool

Measurements added to images can be moved.

To move a measurement arrow:

1. Click the box at one end of the measurement, and drag it to the desired location.



2. If necessary, click the box at the other end of the measurement tool and drag it to the desired location.

Deleting a Measurement tool

Measurements added to images can be removed. To remove a measurement arrow:

1. click the **Image Tools** button to open the tool palette.

2. In the tool palette, click the Measurement button.

   The **Measurement** button changes color, and the measurement toolbar appears.
3. In the measurement toolbar, click the **Erase** button.

   The **Erase** button changes color.
4. click the box at one end of a measurement arrow.
   The measurement arrow is deleted.

Calibrating camera image measurements

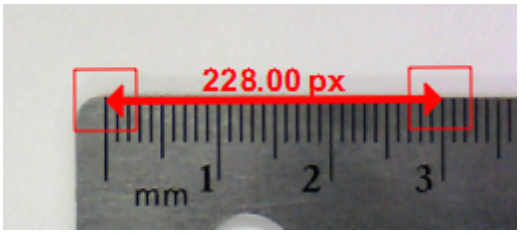
To calibrate measurements, the image must include an object of known length.

1. Click the **Image Tools** button to open the tool palette.

2. In the tool palette, click the **Measurement** button.

3. Click the point on the image at one end of the object of known length.
4. Drag the box to the other end of the object.

A leader line with length display on the image.



5. If necessary, drag the ends of the measurement tool so that it exactly represents the known length.
6. Click the **Measurement** button again.

7. The **Measurement** button changes color, and the measurement toolbar appears.
8. In the measurement toolbar, click the **Measurement** button.

9. The buttons changes color.
10. Click the box at one end of the measurement arrow.
11. The **Image Measurement Properties** screen opens.
12. Click the **Known length:** box, type the known length in your desired units, and click **OK**.
13. Optionally, click the **Digits** box and select the number of decimal places that will be displayed.
14. Click the Units box, delete the existing units, type the name of the units, and click **OK**.
15. Click **OK** to close the Image Measurement Properties screen.

    All measurement tools on the image now use the new calibration. Any new measurement tool that you add will also use the new calibration.

Drawing on a camera image

You can draw and erase on image using one of the follow tools.

- **"Drawing": 66**
- **"Erasing": 66**
- **"Erasing all": 67**

Drawing

1. Click the **Image Tools** button to open the tool palette.

2. In the tool palette, click the **Draw** button.

3. The button changes color and the drawing toolbar appears.

4. To change the pen color, click the color button.

5. Click a point on the image and drag to draw lines.
6. Click the **Draw** button again in the tool palette to turn off the drawing pen and hide the drawing toolbar.

Erasing

1. Click the **Image Tools** button to open the tool palette.

2. In the tool palette, click the **Draw** button.

3. The button changes color and the draw palette appears.
4. In the draw palette, click the **Eraser** button.

The button changes color.

5. To erase parts of a drawing, click a point on the drawing and drag over it.
6. Click the **Draw** button in the tool palette to close the draw palette.

Erasing all

1. Click the **Image Tools** button to open the tool palette.

2. In the tool palette, click the **Draw** button.

3. The button changes color and the draw palette appears.
4. In the draw palette, click the **Eraser** button.

The button changes color.

5. To erase parts of a drawing, click a point on the drawing and drag over it.
6. To erase all drawings from the image, click the **Erase** button again.
7. Click **Yes**.
8. Click the **Draw** button in the tool palette to close the draw palette.

Annotating a camera image

You can annotate an image using one of the follow tools.

"Adding an annotation": 68

"Moving an annotation": 69
"Editing an annotation": 69
"Deleting an annotation": 69

Adding an annotation

1. Optional: If there is more than one image, first select the image for the annotation:
   a. Click the image legend.
      The legend expands.

   b. In the legend, click the image that you want to select.
      The red outline moves to the selected image.
2. Click the **Image Tools** button to open the tool palette.

3. Click the **Annotate** button.

4. The Annotation button changes color, and the image annotation bar opens, showing the eraser and text color box.

5. Click the color box until you see the color you want to use.

6. Click the screen in the location to place the annotation.

7. Enter a note and click **OK**.
8. An annotation appears on the image and the image annotation bar closes.
9. Optional: Drag to move the annotation text box.

Moving an annotation

You can move the text and pointer arrow on an annotation:

- To move annotation text on an image, click the text and drag it to a new location.
- To move an annotation arrow on an image, click the point of the arrow and drag it to a new location.

Editing an annotation

1. Click the Image Tools button to open the tool palette.

2. Click the Annotation button.

3. The Annotation button changes color and the image annotation toolbar displays.
4. Click the annotation you want to edit.
5. Edit the text and click **OK**.

Deleting an annotation

1. Click the **Image Tools** button to open the tool palette.

2. Click the **Annotation** button.

3. The Annotation button changes color and the image annotation toolbar displays.
4. Click the **Eraser** button on the image annotation bar.

5. The Eraser button changes color.
6. Click the all annotations you want to delete.
7. When you finish deleting annotations, click the **Eraser** button to turn off the deletion tool.
8. Click the **Annotation** button to close the annotation toolbar.

Naming an image

1. Click the **Experiment Tools** button to open **Experiment Tools** screen.

2. Click **Manage Data** to open the **Manage Data** screen.
3. Click **Manage Images** to open the **Manage Images** screen.
4. Click **Rename Image…** to open the **Rename Image…** screen.
5. Click the image that you would like to rename and click **OK**.
6. Type the new name of the image and click **OK**.
7. Click **OK** to close the **Manage Images** screen and click **OK** again to close the **Manage Data** screen.

Deleting and Renaming an image

1. Click the **Experiment Tools** button to open the **Experiment Tools** screen.

2. Click **Manage Data** to open the **Manage Data** screen.
3. Click **Manage Images** to open the **Manage Images** screen.
4. Do one of the following:
   - To delete all images, click **Delete All Images**, and click **OK**.
   - To delete a single image, click **Delete Image…**, click the image to delete, and click **OK**.
   - To rename an image, click **Rename Image…**, click the image to delete, and click **OK**

5. Click **OK** to close the **Manage Images** screen, click **OK** again to close the **Manage Data** screen.

Exporting an image

1. Click the **Sharing** button to open the Sharing screen.

2. Click the **Export Images** tab.
3. After saving your images, click **OK** to return to your SPARKlab.

7 Data analysis

In any display, you can view the statistics of data runs, including minimum value, maximum value, mean value, standard deviation, and count (or number of points). In a graph, the area statistic is also available.

A graph also allows you to apply curve fits; draw predictions; and find coordinates, distances, and slopes on data plots.

- "Analyzing data in a graph": 72
- "Viewing statistics in a table": 83
- "Viewing statistics in a digits display": 85
- "Viewing statistics in a meter": 86

Analyzing data in a graph

- "Viewing statistics in a line graph": 72
- "Applying a curve fit": 74
- "Removing a curve fit": 75
- "Drawing a prediction": 75
- "Finding the x- and y-values of a point": 75
- "Finding the x- and y-difference between two points": 77
- "Finding the slope at a point on a data plot": 78
- "Finding the correlation coefficient (r)": 79
- "Displaying the RMSE Root-Mean-Square Error": 81
- "Analyzing data in a multiple-y axes graph": 82
- "Viewing Statistics in a bar graph": 82

Viewing statistics in a line graph

To see the minimum, maximum, mean, standard deviation, count, and area-under-the-curve of a data run:

1. Optional: select a different data run.

   In the display legend, a red outline surrounds the run that is selected for operation. Complete these steps to change which run is selected:

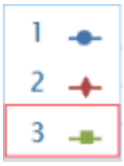
i. Click the legend.

The legend enlarges.

ii. In the legend, click the symbol (but not the check box) of the run that you want to select.

The red outline moves to the selected run.

Sample Legend



Note: When you apply statistics, such as mean or standard deviation, they are applied to the selected run.

2. Click the **Graph Tools** button to open the tool palette.

3. Click the **Statistics** button to open the **Statistics** screen.

4. Click one or more of the statistics.

Selected statistics are highlighted.

5. Click **OK**.

Statistics appear on the graph.

6. Optionally, click part of the data set for statistics to be applied to.

See "Selecting part of a data run for operation in a line graph": 28.

7. Click the **Statistics** button to remove the statistics.

Applying a curve fit

Complete these steps to apply a linear, quadratic, power, inverse, inverse square, or sine fit to a data run:

1. Optional: select a different data run.

   In the display legend, a red outline surrounds the run that is selected for operation. Complete these steps to change which run is selected:

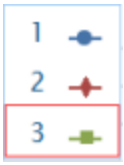
   i. Click the legend.

   The legend enlarges.

   ii. In the legend, click the symbol (but not the check box) of the run that you want to select.

   The red outline moves to the selected run.

   Sample Legend



   Note: When you apply statistics, such as mean or standard deviation, they are applied to the selected run.

2. Click the **Graph Tools** button to open the tool palette.

3. Click the **Curve Fit** button to open the **Curve Fit** screen.

4. Click one curve fit to select it.
5. Click **OK**.

The curve and parameters of the curve appear on the graph.

6. Optionally, select part of the data set for the curve fit to be applied to.
   See "Selecting part of a data run for operation in a line graph": 28.

Removing a curve fit

1. Click the **Graph Tools** button to open the tool palette.

2. Click the **Curve Fit** button.

Drawing a prediction

Complete these steps to manually sketch on a graph:

1. Click the **Graph Tools** button to open the tool palette.

2. Click the **Prediction** button.

3. Do one of the following:
   - Trace a continuous curve on the graph.
   - Click several locations on the graph to draw a series of connected points.
4. To delete the prediction, click the **Prediction** button.

Finding the x- and y-values of a point

Complete these steps to select a point on a graph and display its coordinates:

1. Optional: select a different data run.

   In the display legend, a red outline surrounds the run that is selected for operation. Complete these steps to change which run is selected:

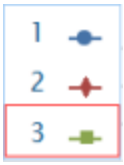
   i. Click the legend.

   The legend enlarges.

   ii. In the legend, click the symbol (but not the check box) of the run that you want to select.

   The red outline moves to the selected run.

   Sample Legend



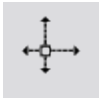
   Note: When you apply statistics, such as mean or standard deviation, they are applied to the selected run.

2. Click the **Graph Tools** button to open the tool palette.

3. Click the **Select** button.

   The button changes color.

4. Click a point on the graph.
5. Click **Done**.
6. Click **Graph coordinate information** button.



7. The x- and y-values of the selected point are displayed.
8. Click the **Graph coordinate information** button again to clear the selection.

Finding the x- and y-difference between two points

Complete these steps to select a range of points and display the change-in-x and change-in-y between the first and last points in the selected range:

1. Optional: select a different data run.

   In the display legend, a red outline surrounds the run that is selected for operation. Complete these steps to change which run is selected:

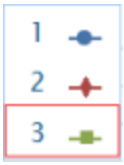
   i. Click the legend.

   The legend enlarges.

   ii. In the legend, click the symbol (but not the check box) of the run that you want to select.

   The red outline moves to the selected run.

   Sample Legend



   Note: When you apply statistics, such as mean or standard deviation, they are applied to the selected run.

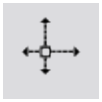
2. Click the **Graph Tools** button to open the tool palette.

3. Click the **Select** button.

The button changes color.

4. Click and drag to select data points.
5. When the desired data points are highlighted, click **done selecting**.
6. Click the **Select** button.

7. Click the **Coordinates** button.



An annotation with the following information appears on the graph:

- The x- and y-values of the first point in the selected range (*x1* and *y1*),
- The x- and y-values of the last point in the selected range (*x2* and *y2*), and
- The x- and y-differences between those two points (*dx* and *dy*).

8. To clear the annotation, click the **Coordinates** button again.
9. To clear the selection, click the **Select** button again.

Finding the slope at a point on a data plot

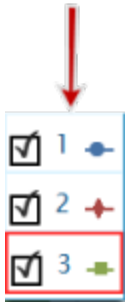
Complete these steps to display the slope at a selected point:

1. Optional: select a different data run.

   In the display legend, a red outline surrounds the run that is selected for operation. Complete these steps to change which run is selected:

   i. Click the legend.

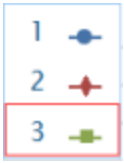
   The legend enlarges.



   ii. In the legend, click the symbol (but not the check box) of the run that you want to select.

The red outline moves to the selected run.

Sample Legend



Note: When you apply statistics, such as mean or standard deviation, they are applied to the selected run.

2. Click the **Graph Tools** button to open the tool palette.

3. Click the **Slope Tool** button.

The Slope Tool appears on the graph displaying the slope at one point.

The Slope Tool appears in the middle of the data run or, if part of the data run has been selected, in the middle of the selected part.

See "Selecting part of a data run for operation in a line graph": 28.

4. Click the arrows of the point selector to move the slope tool to nearby points.
5. To hide the Slope Tool, click the **Slope Tool** button again

Finding the correlation coefficient (r)

To find the correlation coefficient (r):

1. Optional: select a different data run.

   In the display legend, a red outline surrounds the run that is selected for operation. Complete these steps to change which run is selected:

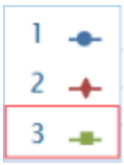
   i. Click the legend.

   The legend enlarges.

ii. In the legend, click the symbol (but not the check box) of the run that you want to select.

The red outline moves to the selected run.

Sample Legend



Note: When you apply statistics, such as mean or standard deviation, they are applied to the selected run.

2. In the legend, click the symbol of the measurement run to analyze.

   A red outline appears around the selected run.

3. Click the **Graph Tools** button to open the tool palette.

   The line graphs tools palette displays.

4. Click the **Curve Fit** button.

   The **Select Desired Curve Fit** screen displays.

5. Click the **Linear Fit** button, and click **OK**.

   The statistics appear on the line graph and the Curve Fit button changes color.

6. To move the statistics box, drag it.

7. To remove the statistics box, click the **Curve Fit** button.

Displaying the RMSE Root-Mean-Square Error

To find the Root Mean Square Error (RMSE):

If more than one data measurement run is displayed, first select a measurement run:

1. Optional: select a different data run.

   In the display legend, a red outline surrounds the run that is selected for operation. Complete these steps to change which run is selected:

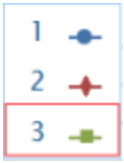
   i. Click the legend.

   The legend enlarges.

   ii. In the legend, click the symbol (but not the check box) of the run that you want to select.

   The red outline moves to the selected run.

   Sample Legend



   Note: When you apply statistics, such as mean or standard deviation, they are applied to the selected run.

2. In the legend, click the symbol of the measurement run to analyze.

   A red outline appears around the selected run.

3. Click the **Graph Tools** button to open the tool palette.

   The line graphs tools palette displays.

4. Click the **Curve Fit** button.

The Select Desired Curve Fit screen displays.

5. Click a curve fit option, and click **OK**.

   The statistics appear on the line graph and the Curve Fit button changes color.
6. To move the statistics box, drag it.
7. To remove the statistics box, click the orange **Curve Fit** button.

   The statistics are removed from the line graph.

Analyzing data in a multiple-y axes graph

All of the actions performed on a single y-axis graph can be performed on multiple-y axes graphs.

See "Creating a multiple y-axes line graph": 31.

You can perform the following:

- **"Viewing statistics in a line graph": 72**
- **"Applying a curve fit": 74**
- **"Removing a curve fit": 75**
- **"Drawing a prediction": 75**
- **"Finding the x- and y-values of a point": 75**
- **"Finding the x- and y-difference between two points": 77**
- **"Finding the slope at a point on a data plot": 78**

Viewing Statistics in a bar graph

To see the minimum, maximum, mean bar values; or standard deviation of a data run:

1. Optional: select a different data run.

   In the display legend, a red outline surrounds the run that is selected for operation. Complete these steps to change which run is selected:

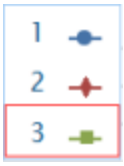
i. Click the legend.

The legend enlarges.

ii. In the legend, click the symbol (but not the check box) of the run that you want to select.

The red outline moves to the selected run.

Sample Legend



Note: When you apply statistics, such as mean or standard deviation, they are applied to the selected run.

2. Click the **Bar Graph Tools** button to open the tool palette.

3. Click the **Statistics** button to open the **Statistics** screen.

4. Click one or more of the statistics options to select it.
5. Click **OK**.

Statistics are added to the chart.

6. Click the **Statistics** button to remove the statistics.

Viewing statistics in a table

To see the minimum, maximum, mean, standard deviation, and count of data runs:

1. Optional: select a different data run.

   In the display legend, a red outline surrounds the run that is selected for operation. Complete these steps to change which run is selected:

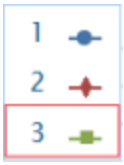
   i. Click the legend.

   The legend enlarges.

   ii. In the legend, click the symbol (but not the check box) of the run that you want to select.

   The red outline moves to the selected run.

   Sample Legend



   Note: When you apply statistics, such as mean or standard deviation, they are applied to the selected run.

2. Click the **Graph Tools** button to open the tool palette.

3. Click the **Statistics** button to open the **Statistics** screen.

4. Click one or more of the statistics.

   Selected statistics are highlighted.

5. Click **OK**.

   Statistics at the bottom of each column.

6. Optionally, click a group of cells for statistics to be applied to.

   See "Selecting cells for operation in a table": 49.

7. Click the **Statistics** button to remove the statistics.

Viewing statistics in a digits display

To see the minimum, maximum, mean, standard deviation, or count of a data run:

1. Optional: select a different data run.

   In the display legend, a red outline surrounds the run that is selected for operation. Complete these steps to change which run is selected:

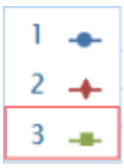
   i. Click the legend.

   The legend enlarges.

   ii. In the legend, click the symbol (but not the check box) of the run that you want to select.

   The red outline moves to the selected run.

   Sample Legend



   Note: When you apply statistics, such as mean or standard deviation, they are applied to the selected run.

2. Click the **Digits Display Tools** button to open the tool palette.

3. Click the **Statistics** button to open the **Statistics** screen.

4. Click one of the statistics to select it.
5. Click **OK**.

   The selected statistic appears in the digits display (instead of the most recently collected value).
6. Click the **Statistics** button to return the digits display to most recent data.

Viewing statistics in a meter

To see the minimum, maximum, mean, standard deviation, or count of a data run:

1. Optional: select a different data run.

   In the display legend, a red outline surrounds the run that is selected for operation. Complete these steps to change which run is selected:

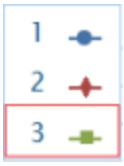
   i. Click the legend.

      The legend enlarges.

   ii. In the legend, click the symbol (but not the check box) of the run that you want to select.

      The red outline moves to the selected run.

      Sample Legend



      Note: When you apply statistics, such as mean or standard deviation, they are applied to the selected run.
2. Click the **Digits Display Tools** button to open the tool palette.

3. Click the **Statistics** button to open the **Statistics** screen.

4. Click one of the statistics to select it.
5. Click **OK**.

   The selected statistic appears in the digits display (instead of the most recently collected value).
6. Click the **Statistics** button to return the digits display to most recent data.

8 Calculations and manually entered data

- "Working with calculations": 88
- "Entering data manually": 90

Working with calculations

1. "Opening the calculator screen": 88
2. "Creating a calculation": 88
3. "Displaying a calculation": 89

Opening the calculator screen

1. Click the **Experiment Tools** button.

   The Experiment Tools screen opens.
2. Click **Calculated Data**.

   The calculator screen opens.

Creating a calculation

Calculations may be a combination of measurement data, math functions, and text.

Tip: You can create User-entered data using a calculation in a table.

Complete one or more of the following steps in any order to build an expression in the calculator screen:

To...	Do this...
Edit an existing expression	Click the 123 or αβγ button.
Start a new expression	Click **Insert**. You can change the name of the expression from the default.
Insert measurement data	Click Measurements to insert a measurement data anywhere in the expression.

Select functions	Click Math, Trigonometry, Statistics, Special 1, Special 2 to change function types as needed as you build the expression.
Select DEGor RAD	Click **RAD** or **DEG** to indicate how angles are measured for the Trigonometry functions..
Add text and numbers	Use the keyboard for text and numbers. Numbers can also be entered using the Math function.
Use Greek letters	Click the αβγ button. Click **CAPS** or Shift to switch between lowercase and uppercase Greek letters.
Add superscript/subscript numbers	Click the αβγ button. Click **CAPS** or Shift to switch between subscript and superscript numbers.
After you have created your expression, perform the following:	
Complete the expression	ClickReturn. SPARKvue may prompt you to enter definitions for variables and constants used in the expression.
Exit the calculator	Click**done**.

Displaying a calculation

Once you have created a calculation, it is available to be shown in any data display.

Complete these steps to select the calculation for display.

i. Touch the **Display Tools** button near the lower or upper left corner of the display.
ii. Touch the **Properties** button.

1. Click the **Measurement** box and click the calculation.
2. Click **OK**.

Entering data manually

1. Open the measurements list in the **Page-build** screen or the **Table Properties** screen.

   See "Opening the measurements list": 90
2. Create a empty data set for number or text data entry.

   See "Creating a data set for manual entry": 91
3. Prepare a table for data entry.

   See "Preparing a table for manual data entry": 91
4. Enter data in the table.

   See "Entering data into a manual data set": 92
5. Optionally, display the entered data in other displays.

   See "Displaying manually entered data": 92
6. Optionally, edit any manually entered number or text.

   See "Editing manually entered data": 93

Opening the measurements list

View the available measurements

1. Click the Home button.

   The available sensors (including cameras) are listed with their respective measurements.
2. Click the icon to expand or collapse the list of measurements for each sensor.

   Expand List

   Collapse List

View the available User-entered Data

1. Click the Home button.

2. Click the **User-entered** tab.

   The User-entered data sets are listed under:

   - User-entered Number Data
   - User-entered Text Data

Creating a data set for manual entry

Complete one of the following tasks.

- **"Creating a data set for manually entered numbers ": 91**
- **"Creating a data set for manually entered text": 91**

Creating a data set for manually entered numbers

1. In the measurement list under **Experiment Clock**, click **Create Data Set**.

   The **Define the Data Set** screen opens.
2. Select the **Measurement Name** box and enter a name for the new data set.
3. Optionally, click the box and enter the name of the units.
4. Click **OK**.

Creating a data set for manually entered text

1. In the measurement list within the **User-entered Text Data**, click **Create Data Set** under **User-entered Text Data**.

   The **Define the Data Set** screen opens.
2. Click the **Measurement Name** box and enter a name for the new data set.
3. Click **OK**.

Preparing a table for manual data entry

Depending on which screen you see, do one of the following:

1. Build a page using a table. See "Starting a new SPARKlab page": 94.
2. Click **Select Measurement**.
3. Click the data set to use. See "Creating a data set for manual entry": 91.

4. Click **OK**.

   A new table appears displaying the empty data set ready for data entry.
5. Enter data. See "Entering data into a manual data set": 92.

Entering data into a manual data set

After creating a data set (see "Creating a data set for manual entry": 91), complete these steps to enter data:

1. Click the **Table Tools** button to open the tool palette.

2. Click the column header for the User-defined data.
3. Select the data set.
4. Click a cell and enter the data.
5. Enter data in a cell:
   a. Click the first table cell where you want to enter data.
   b. Enter a number or text (depending on what type of data set you created).
6. Repeat the previous step to enter data in other cells.

Displaying manually entered data

Once you have created a data set, it is available to be shown in any data display.

Complete these steps to select the data set for display.

i. Touch the **Display Tools** button near the lower or upper left corner of the display.
ii. Touch the **Properties** button.

1. Click the **Measurement** box and click the data set.
2. Click **OK**.

Editing manually entered data

Enter User-defined Data

1. Optional: create a new table.
    a. Click the **New Page** button.

    The build a new page screen opens.
    b. Click the **New Page** button.
    c. Click the **New Page** button.

    A table is added to the page.
2. Click the **Select Measurement** button.
   The **Table Properties** opens.
3. Click the **Measurement** box.
4. Click User-entered.
5. Click Create Data Set.
6. Enter a Measurement Name:.
7. Enter a Unit Name:.
8. Click the your new data set.
9. Click **OK**.
10. Enter your data.
    a. Click a cell within the column for your data.
    b. Enter a value.
    c. Click another cell and enter data.
    d. Repeat until all data is entered.

9 Building SPARKlab pages

- "Starting a new SPARKlab page": 94
- "About adding elements to a SPARKlab page": 95
- "Removing or replacing an image or media file": 95
- "Adding a background image": 96
- "Deleting a SPARKlab page": 96

Starting a new SPARKlab page

A. From the Home screen create a new SPARKlab:

Touch **Build**.

Continue to step 1.

B. Within a SPARKlab add a new page:

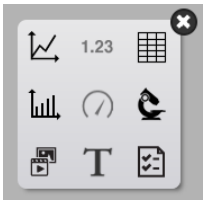
Touch the **New Page** button.

Continue to step 1.

1. Select a template from the library.

Scroll up and down to view templates

2. Touch a display type for each placeholder.



Line Graph

Bar Graph

Media

Digits

Meter

Text

Table

Camera

Assess-ment

3. For Text Boxes: Type in text into the Text Box.
4. For Cameras: Touch the **Image Tools** button. See Capturing a camera image.
5. For other data displays: Select the data for each display on the page.

a. Touch the display data label(s), for example: **Select Measurement**, **X-Axis Variable**, Y-Axis Variable, **Select a Media File**, Add an Assessment

or

b. Open the display properties and select the data.

i. Touch the **Display Tools** button near the lower or upper left corner of the display.

ii. Touch the **Properties** button.

About adding elements to a SPARKlab page

A SPARKlab page is built by first selecting a template, and then adding elements one at a time in the **Build** screen. As elements are added, they are shown in the preview section of the **Build** screen.

See "Starting a new SPARKlab page": 94 for detailed instructions.

Removing or replacing an image or media file

Click the **Camera Tools** or **Media Tools** button to open the tool palette.

Do one of the following:

- Click the **Remove** button to delete the image.

- Click the **Load** button to load a new image file.

Adding a background image

A background image fills the entire SPARKlab page. Elements on the page (data displays, text boxes, and image boxes) are overlaid in front of the background image.

The background image is copied from a saved image file. You can use an image of any size; SPARKvue will re-size and stretch it to fit the page.

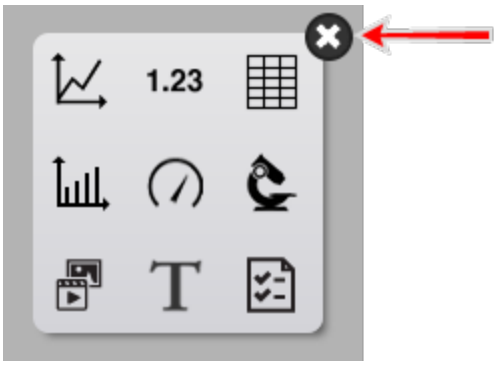
Complete these steps in the Page-build screen (see "Starting a new SPARKlab page": 94):

1. Click the **Select a Background Image** button.

   The **Open** window appears.
2. Click an image file to select it.
3. Click **Open**.

   The background image is added to the preview.
4. Select a template.

   Tip: If you want only the background to appear on the page, close the display selection.



Deleting a SPARKlab page

While viewing the page in a SPARKlab, click the **Delete Page** button.

10 Saving and sharing

- "Saving a SPARKlab (Locally and Online)": 98
- "Printing a lab": 99
- "Exporting data": 99
- "Opening a saved lab": 100
- "Using Online Storage Services": 100

Saving a SPARKlab (Locally and Online)

To save your work locally:

1. Click the **Sharing** button to open the **Sharing** screen.

2. Click **Save File As**.

   The **Save** window opens.
3. Save to the current file or navigate to the folder where you would like to save the lab.
4. Use current file name or enter a file name.
5. Click **OK**.

   Tip: After you have saved a file once using the procedure above, you can quickly save the file again: click **Save File** instead of **Save File As** in the **Sharing** screen.

To save your work using Online Storage Services:

1. Click the **Sharing** button to open the **Sharing** screen.

2. Click **Online Storage Services**.

   The **Online Storage Services** dialog opens.
3. Select the service you would like to use and follow the instructions for the service.

   Note: Depending on your security settings, you may have to click **Allow** to complete the Online Storage Services sign-in process.

   Tip: You can have multiple Online Storage Services open. Repeatedly click **Online Storage Services** to open additional services.

Printing a lab

The SPARKlab cannot be printed directly; however, you can capture SPARKlab pages in the journal and print the journal

Complete these steps to take snapshots of SPARKlab pages and print the snapshots:

1. On each SPARKlab page that you wish to print, click the **Snapshot** button.

2. Each time you click the **Snapshot** button, the Snapshot Quick View appears briefly and an image of the page is added to the journal.
3. Click the **Journal** tab.
4. Click **Print Journal** to open the **Print** window.
5. Click a printer and click **Print**.
6. Click **Done** to return to your SPARKlab.

Exporting data

When you export data, a tab-delimited text file is saved that can be opened in another program.

Note that exporting data is *not* equivalent to saving the lab. If you plan to later reopen your work in SPARKvue, you must also save the lab.

1. Click the **Sharing** button to open the **Sharing** screen.

2. Click **EXPORT DATA** to open the **Export Data** window.
3. Navigate to the folder where you would like to save the file.
4. Enter a file name.
5. Click **Save**.
6. Click **Done**.
7. To view the saved data, open the file in a spreadsheet program, mapping program, word processor, or text editor

Opening a saved lab

1. Click the **Home** button to return to the **Home** screen.

2. In the **Home** screen, click **Saved Work**.
3. Click the file.
4. Click **Open**.

   The lab opens.

Using Online Storage Services

The **Online Storage Services** function allows access to several services such as Google Drive, Box, Dropbox, Evernote, FTP, and WebDAV.

- **"Log in to Online Storage Services": 100**
- **"Open a file from Online Storage Services": 101**
- **"Save a file to Online Storage Services": 101**

Log in to Online Storage Services

1. Click the **Home** button to return to the **Home** screen.

2. Click **Online Storage Services** on the Home page.

   The **Online Storage Services** dialog opens.
3. Select the service you would like to use and follow the instructions for the service.

   Note: Depending on your security settings, you may have to click **Allow** to complete the Online Storage Services sign-in process.

   Tip: You can have multiple Online Storage Services open. Repeatedly click **Online Storage Services** to open additional services.

Open a file from Online Storage Services

1. Click the **Home** button to return to the **Home** screen.

2. Click **Online Storage Services** on the Home page.

   The **Online Storage Services** dialog opens.

3. Select the service you would like to use and follow the instructions for the service.

   Note: Depending on your security settings, you may have to click **Allow** to complete the Online Storage Services sign-in process.

   Tip: You can have multiple Online Storage Services open. Repeatedly click **Online Storage Services** to open additional services.

Save a file to Online Storage Services

1. Click the **Sharing** button to open the **Sharing** screen.

2. Click **Online Storage Services**.

   The **Online Storage Services** dialog opens.

3. Select the service you would like to use and follow the instructions for the service.

   Note: Depending on your security settings, you may have to click **Allow** to complete the Online Storage Services sign-in process.

   Tip: You can have multiple Online Storage Services open. Repeatedly click **Online Storage Services** to open additional services.

11 Keeping a journal

The journal allows you to keep a record of your work in a series of pictures and captions as your science investigation progresses.

These steps outline the process of keeping a journal. See the following tasks for detailed instructions.

1. Take a snapshot.

   An image of the SPARKlab page is recorded.
2. Optionally, add a caption to the snapshot.
3. Repeat the previous steps at anytime during your science investigation.
4. Save, export, or print the journal.

Taking a snapshot

At any time during your science investigation, complete these steps to save an image of the SPARKlab page.

1. Click the **Snapshot** button.

   The SPARK records an image of the SPARKlab page and the thumbnail is displayed with other snapshots.
2. Click on a thumbnail to view the snapshot.
3. Click the close button.

Opening the journal

Click the **Journal** button.

Adding a caption to a snapshot or editing an existing caption

1. Click the **Journal** button.

2. Click the **Name** box and enter or edit the caption name.
3. Click the **Notes** box and enter or edit the notes.
4. Click **OK**.

Navigating in the journal

1. In the journal, click a thumbnail on the right side of the screen to view a journal entry.
2. Drag up or down to scroll through the thumbnails.

Deleting a journal entry or snapshot

In the journal or the Snapshot Quick View, click the **Delete** button to delete the currently visible journal entry.

Rearranging journal entries

In the journal, click the **Move Journal Entry Up** button or **Move Journal Entry Down** button to change the position of the currently visible entry.

Closing the journal

Click **OK** to close the journal and return to the SPARKlab.

Saving a journal

Do one of the following to save a journal:

- Save the entire lab. See "Saving a SPARKlab (Locally and Online)": 98.

  The journal is saved as part of the lab.
- Export the journal.

  The journal is saved in format that can be viewed in a web browser.

Printing a journal

1. If you are currently viewing the journal, click **Done** to return to the SPARKlab.
2. Click the **Sharing** button to open the **Sharing** screen.

3. Click the **Journal** tab.
4. Click **Print Journal** to open the **Print** window.
5. Click a printer and click **Print**.
6. Click **Done** to return to your SPARKlab.

12 Common tasks

- "Turning pages": 105
- "Returning to the Home screen": 105
- "Entering symbols and Greek letters": 105
- "Opening the About SPARKvue screen": 106
- "Setting the language": 106

Turning pages

- Click the arrows of the **Page Navigator** to turn to the next page or previous page.

- Click the center of the **Page Navigator** to open a menu from which you can select any page in the SPARKlab.

Returning to the Home screen

Click the **Home** button to close a SPARKlab and return to the **Home** screen.

Entering symbols and Greek letters

You can use the on-screen keyboard for symbol and Greek letter input.

- To enter punctuation and other symbols, click the **Punctuation** button.

- To enter Greek letters, click the **Greek Letters** button.

- Click **caps** or **shift** to switch between lowercase and uppercase Greek letters.
- To enter subscript and superscript numbers, use the number keys on the Greek keyboard.
- Click **caps** or **shift** to switch between subscript and superscript.
- When you have finished entering symbols or Greek letters, click **done**.

Opening the About SPARKvue screen

1. Click the **About SPARKvue** button to open the **About SPARKvue** screen.

2. Click **About SPARKvue** to view information about the installed version of SPARKvue.

Setting the language

1. Click the **Device Tools** button to open the **Device Tools** screen.

2. Click the **Languages** button.
3. Click the **Languages** box and select a language.
4. Click **OK** to close the **Select Language** screen.
5. Click **OK** to close the **Device Tools** screen.
6. Exit SPARKvue and restart it.